

The present invention is directed to a thermal transfer roller having an outer cylindrical shell which contacts a substrate being heated or cooled, and an inner cylindrical shell which is coaxially positioned within the outer shell to define an annulus between the inner cylindrical shell and the outer cylindrical shell through which heat transfer fluid may flow.

As shown in Figs. 1 and 2, the thermal transfer roller also includes a roll journal on one or both ends of the thermal transfer roller and a passage extending along a central axis of the thermal transfer roller between an inlet end of the thermal transfer roller and an outlet end of the thermal transfer roller. The passage transfers heat transfer fluid from the outlet end to the inlet end and is in fluidic communication with the annulus.

Each roll journal comprises a plurality of channels, defined by walls having a uniform thickness, extending radially outwardly from the passage to the annulus; each channel becoming progressively wider as it approaches the annulus. As each channel transitions into the annulus, a large transition area is provided by the widened channels to allow fluid to flow into the annulus.

As set forth in the Specification at page 11, line 17 through page 12, line 13:

“The purpose of channels 46 is to substantially prevent the heat transfer fluid from assuming an angular or spiral flow pattern within the

end chamber, particularly within the inlet chamber 28, due to rotation of the roller. Angular flow patterns in the end chambers (particularly inlet chamber 28) cause increased fluid pressure and reduce the volume of fluid delivered by a typical constant-pressure fluid pump. The tendency for angular or spiral fluid flow increases with roller velocity, causing further pressure increase and further reduction in fluid volume. By substantially reducing angular or spiral flow within the end chambers, the drop in fluid volume (and heat transfer) at higher roller velocities is substantially diminished.

The channels 46 are also designed to facilitate a substantially uniform, even discharge of fluid into cylindrical slot 34 entering the annulus 16 (Fig. 2) or into numerous smaller openings 35 entering the annulus 16 (Fig. 1). This is accomplished in part by providing channels 46 with a wider end approaching the annulus, and a narrower end approaching the journal 24. This configuration permits the channels to be immediately adjacent or very close to each other at both ends, and minimizes the amount of space not occupied by channels. By minimizing the distance between adjacent channels approaching the annulus, a substantially even fluid discharge around the circumference of the annulus is maintained.”

Claim Rejections - 35 U.S.C. §103

The rejection of Claims 1-25 under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,292,298 (“Scannell”) in view of U.S. Patent 4,658,486 (“Schönemann”) or U.S. Patent 5,887,644 (“Akiyoshi et al.”) or U.S. Patent 5,899,264 (“Marschke”) is respectfully traversed, particularly in view of the following remarks.

The Examiner alleges that Figs. 1-3 and 5 of Scannell disclose all the claimed features of the present invention with the exception of the passage extending between the inlet and outlet ends of the roller. Further, the Examiner alleges that

Schönemann, Akiyoshi et al. and Marschke disclose that it is known to have a passage between the inlet and outlet ends of a roller for the purpose of saving space and manufacturing costs (i.e. using less tubing in the plumbing of the fluid supply and removal system) by delivering and removing a fluid to and from only one end of the roller. Thus, the Examiner alleges that it would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Scannell the passage between the inlet and outlet ends of the roller for the purpose of saving space and manufacturing costs by delivering and removing the fluid to and from only one end of the roller as disclosed in Schönemann, Akiyoshi et al. and Marschke.

Applicants respectfully submit that the Examiner has over-simplified the present invention, when alleging that Scannell discloses all the claimed features of the present invention with the exception of the passage extending between the inlet and outlet ends of the roller. The thermal transfer roller of the present invention comprises an outer cylindrical shell and an inner cylindrical shell which is coaxially positioned within the outer shell to define an annulus between the inner cylindrical shell and the outer cylindrical shell, and a particularly configured roll journal positioned on each end of the thermal transfer roller.

The combination of the present invention overcomes the problems associated with angular or spiral fluid patterns assumed by the heat transfer fluid in

the end chamber and with uneven fluid distribution around the circumference of the annulus by providing a plurality of channels within each roll journal extending outwardly from the passage to the annulus; each channel becoming progressively wider as it approaches the annulus. As each channel transitions into the annulus, a large transition area is provided by the widened channels to allow fluid to flow into the annulus.

Scannell does not suggest nor provide any motivation for having a plurality of channels which progressively widen as the channels approach the annulus to reduce angular or spiral fluid flow and provide a substantially uniform and even distribution of fluid. Rather, Scannell teaches away from such configuration by teaching the use of a plurality of spiral channels 19 in the roll 10 to provide fluid communication with an axial bore through an associated bore 44, whereby the fluid communication can be blocked by insertion of a plug into an interesting bore 50, 90. Thus, the fluid must travel through a small, constricted area, i.e. the bore 44. One skilled in the art of thermal transfer rollers would not be motivated to combine Scannell with any prior art reference cited by the Examiner to arrive at Applicants' claimed invention.

The references relied upon by the Examiner do not render Applicants' claimed invention obvious in the manner required by 35 U.S.C. §103. Scannell, alone

or in combination with Schönemann, Akiyoshi et al. or Marschke, does not teach or suggest a plurality of channels formed within each roll journal which extend radially outwardly from the passage to the annulus, wherein each channel becomes progressively wider as it approaches the annulus. Further, the prior art references provide no expectation to one having ordinary skill in the art of thermal transfer rollers, even combining the teachings in the prior art references, that the purpose of preventing angular or spiral flow patterns would be achieved with the intended result of improving the fluid distribution about the annulus. Applicants respectfully submit that no *prima facie* case of obviousness has been made. Thus, Applicants respectfully request withdrawal of the rejection of Claims 1-25 under 35 U.S.C. §103 as being unpatentable over Scannell in view of Schönemann or Akiyoshi et al. or Marschke.

CONCLUSION

Applicants intend to be fully responsive to the outstanding Office Action. If the Primary Examiner detects any issue which the Primary Examiner believes Applicants have not addressed in this response, Applicants' undersigned attorney requests a telephone interview with the Examiner. The undersigned can be reached at (847) 490-1400.

Serial No.: 09/240,524

Docket No.: KCC-14,026-CPA

In view of the above remarks, Applicants sincerely believe that Claims 1-25 of this patent application are now in condition for allowance and, thus, respectfully request early allowance.

Respectfully submitted,

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